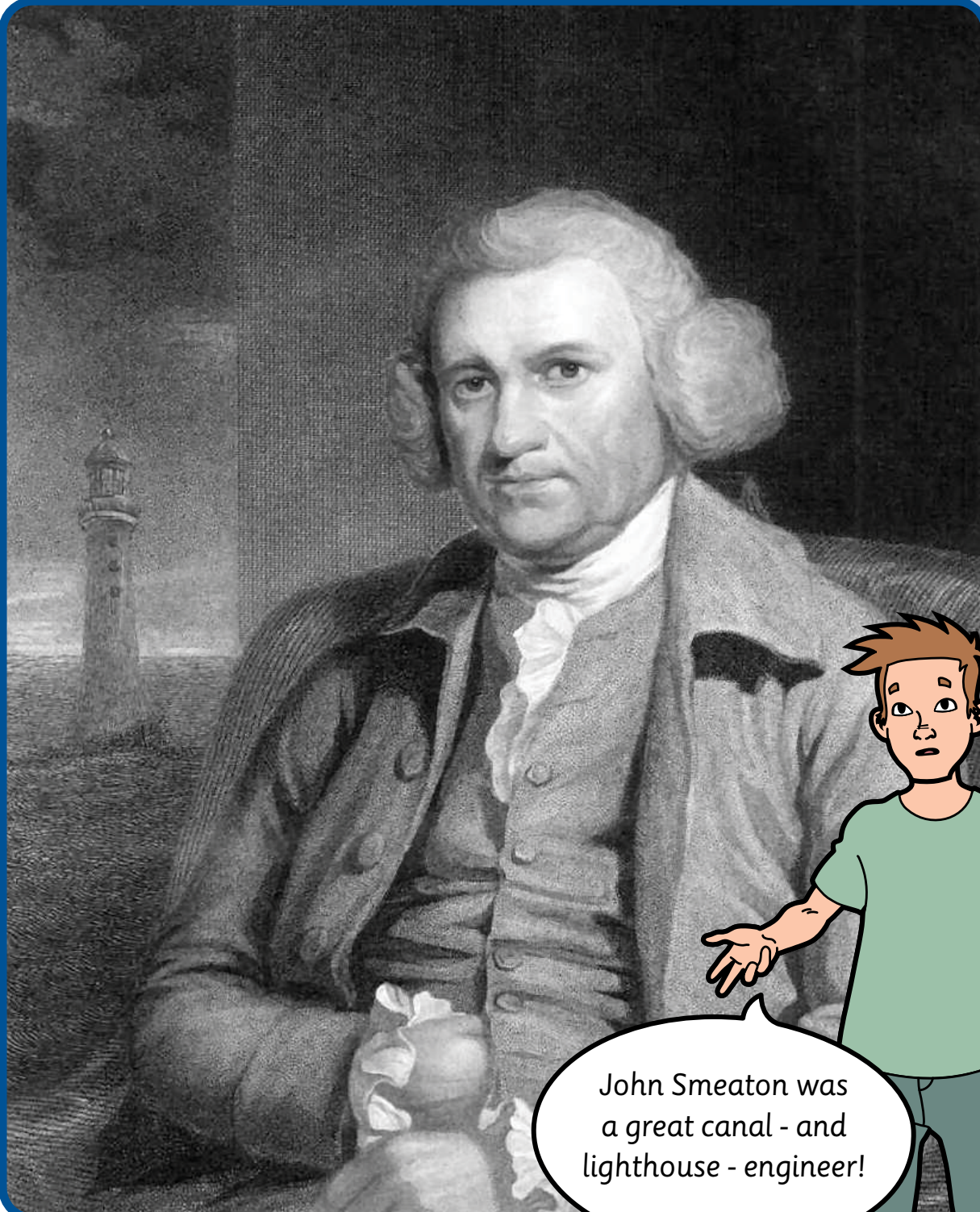


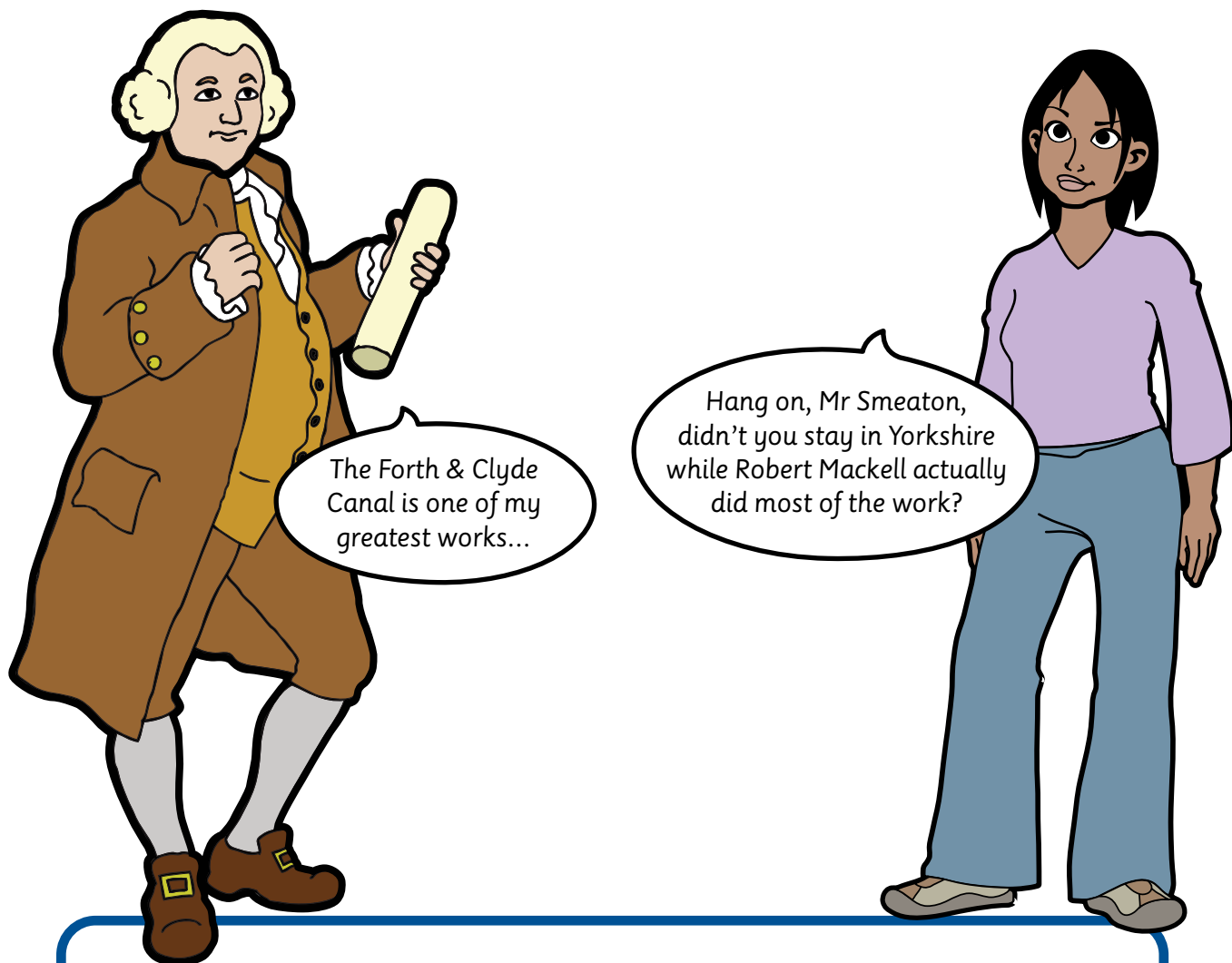
Scottish Lowland Canals Fact File



John Smeaton

John Smeaton was
a great canal - and
lighthouse - engineer!

Hey - big thinkers!



Canals today are peaceful, quiet spots for us to enjoy wildlife and pleasure-boating. It's hard to imagine that when they were built, they were a modern and sophisticated transport route for a country recovering from civil war.

It's the mid-eighteenth century and Scotland is excited by a new idea in transport - canals. But building these canals will take clever men who are capable of using new technology and science in a groundbreaking way. Men in the 1750s only live about 30 - 40 years, and so long projects such as canal construction take more than one engineer's lifetime.

First comes the Forth & Clyde Canal, with plans drawn up by the great engineer John Smeaton, between 1768 and 1773. But Smeaton is based in Yorkshire, not Scotland, and so he uses an on-site local engineer, Robert Mackell, to carry out his plans. Mackell is a plain-talking man, an earlier rival of Smeaton's. He often makes changes to suit local needs and conditions.

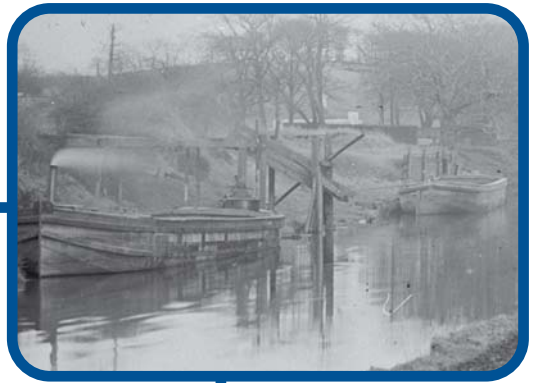
Problems with money stop the first phase of construction. When work restarts in 1785, the engineer Robert Whitworth takes charge, as Smeaton is now too old and unwell and Mackell has died. Whitworth is in charge of building the aqueduct – a special bridge to carry the canal - over the river Kelvin at Maryhill. The Forth & Clyde Canal is opened in 1790.

The Monklands Canal then connects the coalfields near Glasgow to the Forth & Clyde. It is designed by the famous steam engineer James Watt, and opens in 1793.

It is not until 1813 that the engineer Hugh Baird is taken on to develop the Union Canal which finally links Scotland's capital city, Edinburgh, and Falkirk on the Forth & Clyde Canal. Baird fights off competition from other great engineers such as Robert Whitworth, John Rennie and lighthouse pioneer Robert Stevenson to secure the contract.

It probably helps when Thomas Telford, the creator of the Caledonian Canal and the greatest engineer of them all, praises his ideas! Baird's canal opens in 1822, containing only one lock flight (now replaced by The Falkirk Wheel), but travelling over no less than three aqueducts.

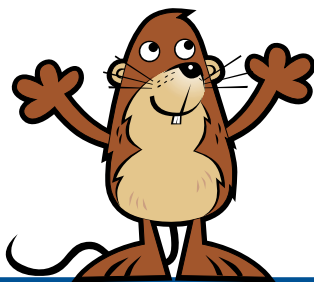
Only seven years later in 1829, the engineer George Stephenson unveils the first commercial steam train, and the era of the canal as a leading technology is over.



Coal being loaded on to a 'scow' from a chute on the Monkland Canal.



The Falkirk Wheel connects the two different levels of the Union Canal and the Forth & Clyde Canal, using the weight of water and boat combined to raise and lower its high-tech lifts.

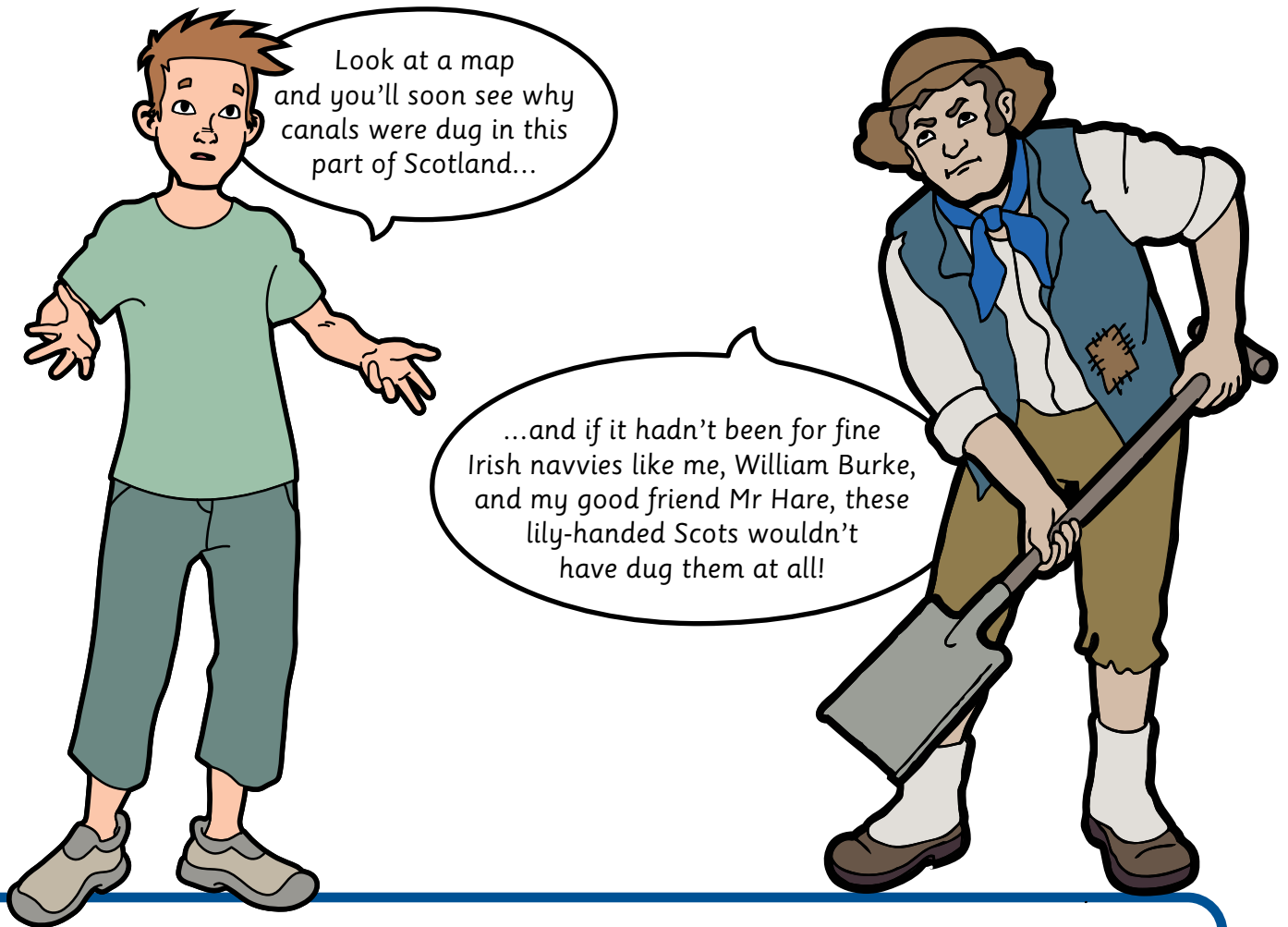


When the Forth & Clyde Canal is opened, Whitworth pours a **hogshead of water** from The Firth of Forth into the River Clyde to mix the two seas symbolically.

When the canals are reopened in July 2001, **Prince Charles** reverses the gesture by pouring Clyde water back into the Forth!

**Strange
but True**

Which way to go?



Today, cars zoom between Edinburgh and Glasgow along the M8 motorway, but 250 years ago it was a different story: travel by horse or on foot along rough roads mired in mud was miserable and slow. Travellers risked accidents and robbery along the way.

Look at a map. See how Scotland's 'waist' narrows between Glasgow in the west and Edinburgh in the east? It's 1768 and creating a canal for trade between the two coasts along this narrow belt seems a sensible money-making move.

At first, rich merchants are keen to build a small and simple 'barge canal' between the heart of Glasgow and the east coast. But this wouldn't be big enough to provide a route across Scotland for larger, sea-going ships.

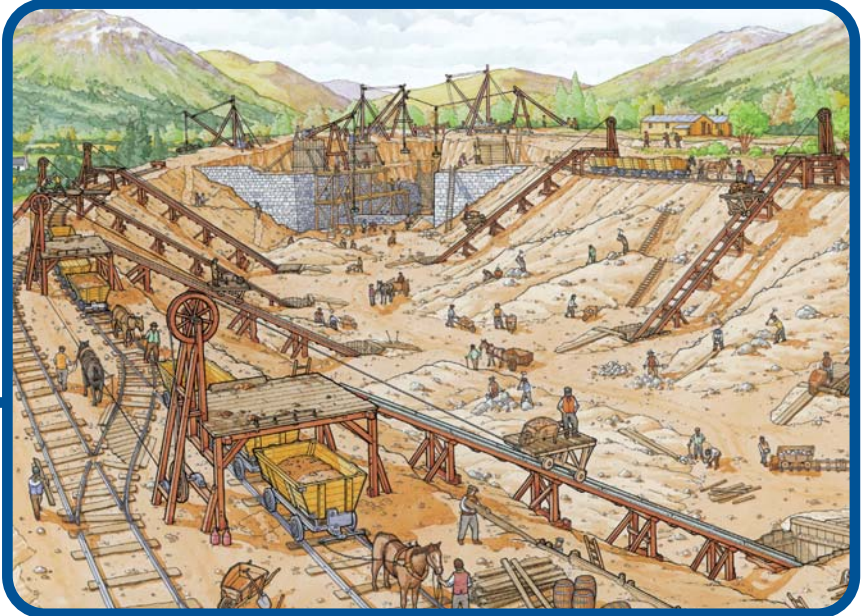
Common sense wins and a bigger canal – the Forth & Clyde – is agreed by Parliament. Parliament agrees branch canals should be built to Bo'ness and to Glasgow – but unfortunately for Bo'ness, their branch is never completed.

The town is left stranded without a canal. Instead, the new town of Grangemouth grows up where the Forth & Clyde Canal meets the Firth of Forth.

The last section of the Forth & Clyde Canal between Glasgow and Bowling (where it connects to the River Clyde and the sea), is completed in July 1790. Later that year, a cargo boat, the sloop Agnes, makes the first sea-to-sea crossing from Leith to Greenock. The Forth & Clyde Canal is 35 miles (56 km) long.

Other canals are dug and connected to the Forth & Clyde. The coal-carrying Monkland Canal in 1793, at just 12 miles (20 km) long. The Union Canal between Edinburgh and Falkirk is 31½ miles (51 km) long and is a 'contour canal', meaning it wiggles around obstacles where possible rather than using locks to climb up them - this keeps the construction costs down.

Digging the canals is long, hard work for strong men, and many 'navvies' from Ireland arrive to support the local workforce in digging the 'navigations'. Some navvies are, in fact, very tough women - disguised as men.



Work in constructing canals was often dirty and dangerous.



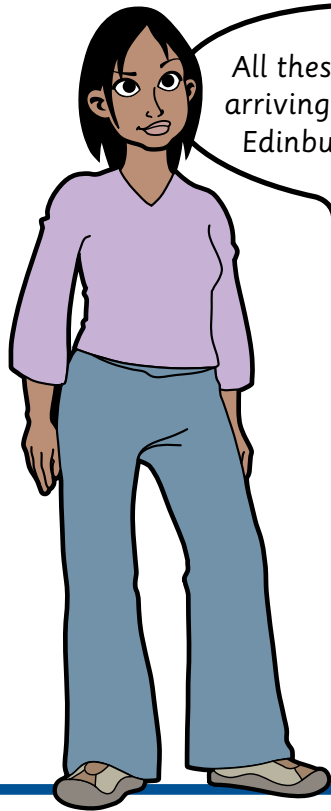
The 'Emma', laden with emigrants heading for larger vessels leaving Scotland altogether.

The Irish people come to Scotland for work because the potato famine has destroyed their livelihoods at home. Local Scots hate it when many of the Irish decide to stay on. The Scots need the work too – many Highlanders have lost their home and way of life during the 'clearances', when landowners force them to leave their traditional small farms to make way for sheep.

Irishmen **William Burke** and **William Hare**, who later become infamous for bodysnatching and murder in Edinburgh, both come over to Scotland first to work as navvies on the Union Canal.

**Strange
but True**

We just want more stuff!



All these things to buy, arriving in Glasgow and Edinburgh by canal...



... yes, my dear, and unbroken, unlike most fragile deliveries which made by cart! Look at my fine new tea service – from China!

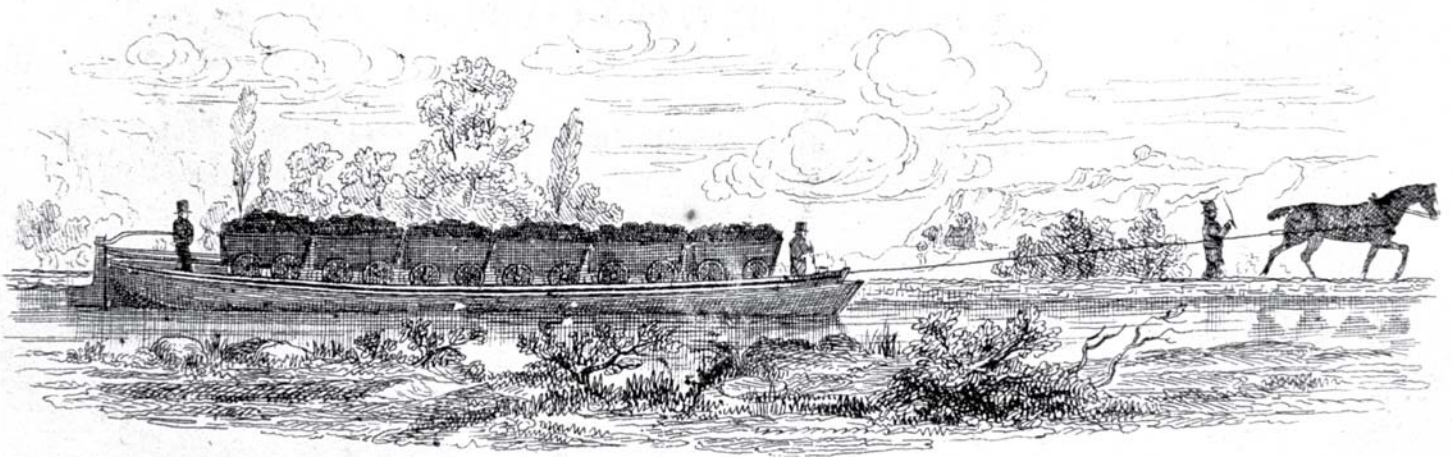
Today, we understand the need to grow and make things locally, because transporting goods around the world is bad for the environment. But in the eighteenth century this was not an issue. What people wanted was new, fresh food and exciting products from exotic places. Their horizons were expanding, and the canals could bring the stuff they wanted.

It's 1770 and canal trade is doing well. All kinds of good things are flooding into and out of Scotland via the new Forth & Clyde Canal. Not just fresh fish and seafood, but also things like apples from Holland, tar from Russia and wood from the Baltic and America. The Canal Company extends the Glasgow Branch of the canal to a new terminal basin, Port Dundas, with warehouses and a village built alongside. Many boat-owners now prefer to get to the city by canal rather than using the River Clyde.

Industry needs more and more coal powers the factories and mills of Lowland Scotland, helping to feed the demand for more things to buy and sell. In 1793, the first barge of Monkland coal arrives in Glasgow by canal. As supply increases, coal prices begin to fall, but the canal carters cause problems by cheating their customers.



Coal barges like this one near Edinburgh were a frequent sight in the late nineteenth century.



CANAL RAILWAY WAGGON BOAT.

Horses were frequently used – and abused! – on the early canals

Sharp practices are solved by bringing in licensing for the horses and carts, and providing weighing machines. But for a long time, people don't trust canal coal.

In spite of this, there's a huge amount of coal coming into Edinburgh, which means a second canal basin has to be built at Port Hopetoun to provide space for unloading the barges. Haig's Distillery also has its own basin – full of whisky (in barrels on boats, of course)!

Canal boats don't move very fast by twenty-first century standards, but the new system of canals provides a reliable, safer - and so often quicker - trade route than the awful roads.



Port Hopetoun, once part of the Union Canal (now built over) was situated below Castle Rock in Edinburgh.

Strange
but True

Tar and old rope is used to make wooden boats waterproof, by 'caulking' the gap between the planks.

A challenging landscape



The Union Canal was supposed to have been less expensive than others...



...ach, all they ever talk of is money! My poor lad was crushed working on Mr Hugh Baird's precious Union Canal. Aye, they gave him a hospital bed - and brought a surgeon to take off his leg, but 'twas no use, he died anyway...

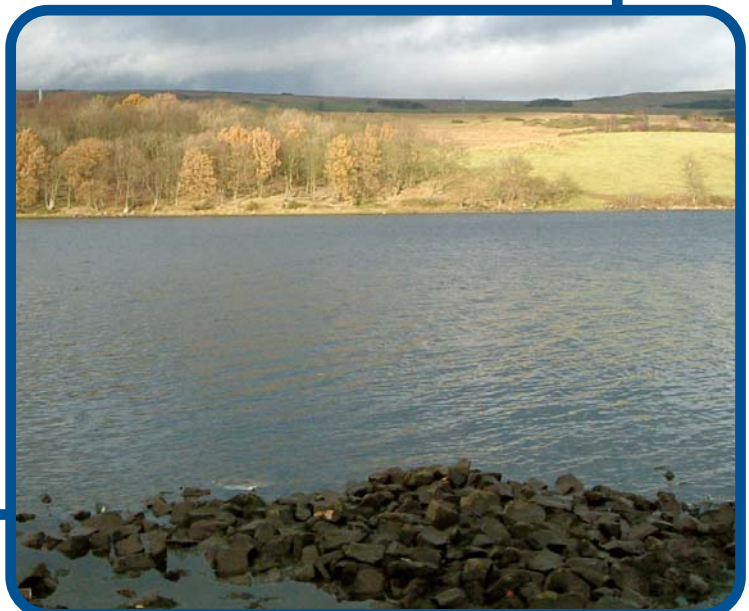
The brilliant technological solutions the engineers found to building canals across our difficult landscape can still amaze us today, when we visit the tunnels, aqueducts and lock flights of Scotland's Lowland Canals.

Canals everywhere have locks, which help to change their level and so move boats up and down hills. But in the 1770s, the routes of Scotland's Lowland Canals are creating challenges which will take more than locks alone to solve. How to build a canal through a bog where men sink up to their neck? Or across a steep valley? Or through a mountain of solid rock?

The clever engineers have no computers to help them, but must rely on common sense, accurate observation and measurement, excellent mathematical and scientific skills, and a good understanding of local geology.

Lives are at stake. They have to get it right.

Water supply too is essential to canal success, as without it boats cannot use the locks. The engineers have to measure the quantities of water available from nearby lochs, rivers and burns at the driest and wettest times of year before deciding on a route. Sometimes, special reservoirs of water need to be built to ensure a year-round supply of water.



The Townhead Reservoir, still providing a valuable source of water today.

- Building a tunnel on the Union Canal's tunnel at Falkirk is unavoidable – there's no easy way round the hill! 696 yards (636 metres) long, the tunnel is cut from both ends - and shafts are cut from above, to allow air to circulate and stone to be removed from the excavations.
- Smeaton and Mackell tackle the problem of taking the Forth & Clyde Canal across Dullatur Bog by building 50 feet (15 metre) deep artificial embankments of willow, earth and stone.
- To provide a continuous water supply for the Forth & Clyde Canal, Smeaton and Mackell create the Townhead Reservoir, diverting water from the nearby Kilsyth Hills.
- They also create the Luggie Aqueduct, Scotland's first, a single arch 15 metres (50 feet) across and 27 metres (90 feet) deep at Hillhead near Glasgow. It is built in three sections and it is almost impossible to spot the joins.



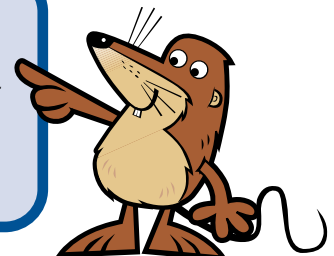
Walk through the eerie Falkirk Tunnel and you may get dripped on – the porous stone allows water through, preventing the weight above from damaging the tunnel.



Canal engineers became masters at moving water, as here at the Luggie Aqueduct.

**Strange
but True**

At Ratho, in **1820**, navvies dig up the huge tusk of a **woolly mammoth** from pre-historic times. The tusk is now in the National Museum of Scotland.



The beloved boats



It must have been fun to be a kid on the canal boats...



...fun? No way! Hard work, more like! But my Dad did once clean out the coal dust from our scow and took us all up the canal for games and a picnic...

Today pleasure boats can sail up and down the canal when they like, driven by the power of an engine. But in the early days of canals, things were different: canal boats had to rely on wind or horse power.

In 1770, no canal boat has an engine. Without the strong current of a fast-flowing river to help them along, the boats rely on a favourable wind for power. Because the weather doesn't always oblige, a new solution has to be found. 'Tracking' horses, which tow boats along the canal from the 'tow path', become important additions to canal life.

Some larger boats need teams of two or more horses! The trackers, who lead the horses, are eventually licensed. The new rules ban trackers under the age of 15, and any man who leaves his horse to plod along dangerously all on its own! Many tracker horses have a grim life, and drown if they fall into the canal because they can't climb out unless there is a sloped launching slip nearby. The Union Canal is built with 'kicking stones' along the edge of the towpath to stop horses falling in.

The earliest canal boats are flat-bottomed wooden barges known as lighters or scows. Over time, these names evolve to mean a horse-drawn boat (scow) or a steam-driven boat (lighter).



A horse-drawn 'scow' or 'lighter', circa 1890.

All that remains of 'Charlotte Dundas', the world's first paddle steamer, are models and plans.



Wooden boats become replaced by stronger iron boats – people can hardly believe these heavy vessels can float! The earliest steam boats are driven by paddles and prove unpopular, but with the arrival of the 'screws' (propeller driven boats), steam power is on the canals to stay. The earliest steam screws make a puffing noise through their funnels and become known as 'puffers'. The name sticks, even when after the engines are improved to stop puffing.

The puffers have a keel which allows them to cut through waves, so they can work on the sea as well as the canal. Many are built in boatyards right by the canal, such as J Hay & Sons Ltd in Kirkintilloch.

The puffers are nothing like the picturesque, painted narrowboats of the English canals, but very basic, with a crowded, shared cabin for the crew, holding a stove and a few bunks.

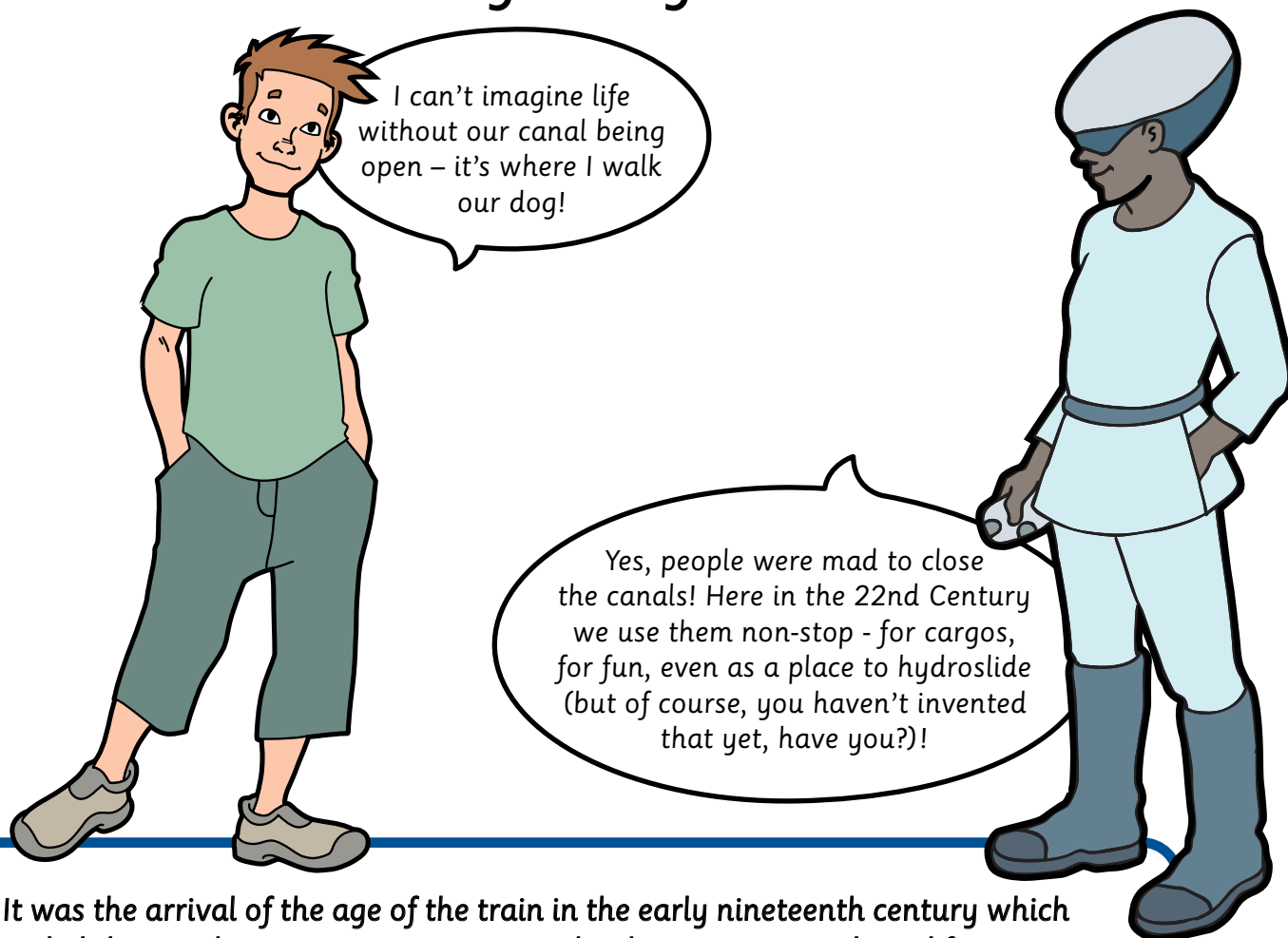
Overloading is a common problem on the early boats, made riskier in bad weather when gales and rain hit exposed sections of the canal. Rainwater and wind can sink a heavy boat which has an uncovered hold. If a canal freezes, an ice breaker - a heavy boat with a specially strengthened bow - is brought through to keep the canal open.

Collisions often happen on these crowded, competitive waters, especially as unpowered, wooden boats can be difficult to steer. If the canal's structure is damaged, the boat's master has to pay for the repairs.

In **1803** William Symington builds the world's **first successful paddle steamer** tug, Charlotte Dundas and trials her on the Forth & Clyde, but the idea is abandoned over concerns about the waves (or wash) caused by its paddle damaging the canal. It was an idea ahead of its time, but wash from powerful boats is still a problem **eroding the canal** sides today.

Strange
but True

The end and the beginning



It was the arrival of the age of the train in the early nineteenth century which ended the canal's era as top transport technology. Better roads and faster engines meant lorries and cars then replaced the trains as our favoured means of transport. But today, we are beginning to question the dominance of the car - things are changing again.

The Monkland Canal closes in 1942 and never reopens - but still supplies the Forth & Clyde Canal with water.

Use of the Union Canal dwindles from the 1930s onwards and it closes in 1963 - the connecting locks at Falkirk are built over. In 1965 the Forth & Clyde Canal also closes, considered by many an outdated reminder of a long-gone age. Train and then road links replace it as a means of transport. It looks like the end for the Lowland Canals.

But many local people protest, a Scottish Inland Waterways Association is formed and a long campaign for the restoration of the Forth & Clyde and the Union Canals begins. The dream is finally realised in 2001 when the two canals reopen separately as part of The Millennium Link project. They are finally connected again at The Falkirk Wheel in 2002.

Today, boats can once more travel by canal between Scotland's two largest cities, and so can walkers and cyclists along the canal-side towpaths (some designated national cycle routes). Both canals are still owned and managed by British Waterways Scotland and will always be a source of great local and national pride.



Why not visit
The Falkirk Wheel - download
a Trail and Fact File at
www.wow4water.net?



The Forth & Clyde and the Union Canals provide a haven for wildlife and for anglers who catch coarse fish in the muddy but very clean water. They also supply a delightful network of sites for birdwatching. Commercial companies are beginning to use the canals again for the sport and leisure industries – and as a green transport route, too.

Who knows what the future holds for our Lowland Scottish canals? Perhaps you can be part of it!

Take a pair of binoculars to any canal bank in Scotland and you'll be amazed by what you spot!

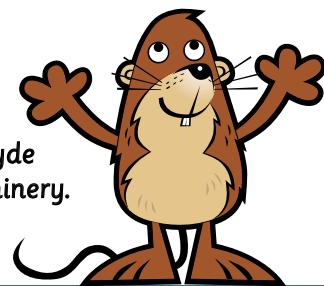
Strange but True



Many factories used the water supply the canals could provide. In the 1940s, water used to cool machinery in the huge **Singer Factory** in Clydebank raised water temperatures so high that when someone released **goldfish into the canal**, the fish bred!

Local people can still remember catching goldfish.

The Singer Factory in Clydebank was built right on the Forth & Clyde Canal – both for transport and as a water supply for cooling machinery.



Always remember to stay **SAFE** near water – Stay Away From the Edge.